

DRAFT IDENTIFICATION OF "COCs" AND CONTAMINANT MOBILITY EVALUATION CRITERIA FOR THE DRAFT FEASIBILITY STUDY

This memorandum summarizes the approaches used to identify "informal contaminants of concern" ("COCs")¹ for consideration in the draft Feasibility Study (FS) and indicator chemicals for which contaminant mobility will be assessed in evaluating remedial alternatives in the FS. In the FS, the protectiveness of remedial alternatives will be based on the extent to which exposure to COCs is reduced over time. Consistent with the RI/FS process, chemicals posing potentially unacceptable risk were identified from the Baseline Human Health Risk Assessment (BHHRA) and Baseline Ecological Risk Assessment (BERA); for the purposes of this evaluation, these chemicals are considered informal "COCs." In addition, the Lower Willamette Group (LWG) has compared individual surface water and transition zone water (TZW) sampling results, without any temporal or spatial averaging, to various drinking water and surface water quality criteria, with the resulting chemicals identified as informal "COCs" that will also be evaluated in the FS. The overall process for the surface water and TZW screening is summarized below, and the draft list of "COCs" is provided.

The resulting set of "COCs" is large and the FS cannot practicably evaluate all the chemicals for each remedial alternative. Therefore, a smaller group of indicator chemicals has been identified that represent the mobility of the "COCs." The indicator chemicals and the process by which they were identified are summarized below.

IDENTIFICATION OF "COCs" FOR DRAFT FS

Objectives for Water Screening to Support the Draft FS

EPA has required the following water screening efforts to support the FS:

- In the Remedial Investigation (RI), screen the maximum concentrations of chemicals present in near-bottom surface water samples against Regional Screening Levels (RSLs) for tap water and/or Safe Drinking Water Act (SDWA) non-zero maximum contaminant level goals/maximum contaminant levels (MCLGs/MCLs) to potentially include in the FS contaminant mobility evaluations of remedial alternatives
- Screen existing surface water and TZW sample results against MCLs and surface water quality criteria to identify the chemicals to be evaluated in the FS alternatives analysis.

The LWG has agreed to include all "COCs" in the FS contaminant mobility evaluations including chemicals resulting from the screening of individual maximum surface water and TZW

¹ The LWG has agreed to carry into the FS all chemicals that potentially pose unacceptable risk to human health and the environment as identified in the BHHRA and BERA, and those chemicals screened in when surface water and TZW sampling results are compared to drinking water and surface water quality criteria, without taking into account any spatial or temporal averaging. For purposes of this memorandum, those chemicals are referred to as "COCs." However, these chemicals are not formally defined as COCs because it has not yet been determined that they do, in fact, pose unacceptable risk. COCs will be proposed in the LWG's risk management recommendations documents and ultimately will be determined by EPA in the Record of Decision.

samples and chemicals posing potentially unacceptable risk as identified in the BHHRA and BERA. This does not mean that every "COC" will be the subject of detailed calculations and modeling (due to logistical issues). An FS typically quantifies contaminant mobility using a representative subset (i.e., "indicator chemicals") of all COCs.

RI Human Health Surface Water Screening Approach for the Draft FS Chemical Mobility Evaluation

All surface water sample results in the BHHRA database, including near-bottom samples, were included in this screening effort. Individual sample results were screened against SDWA non-zero MCLGs, and in their absence, SDWA MCLs and tap water RSLs². Individual sample results were also screened against National Recommended Water Quality Criteria (NRWQC) for Consumption of Organisms. Chemicals exceeding one or more of these screening values are included in the human health surface water screening results summarized in Table 1. A complete summary of this screening effort will be provided in the revised RI Report.

Table 1. Chemicals from RI Human Health Surface Water Screening.

Aldrin	Chromium hexavalent	Indeno(1,2,3-cd)pyrene	Total DDT
Arsenic	Chrysene	MCP	Total Dioxin/Furan TEQ
Benzene	cis-1,2-Dichloroethene	Naphthalene	Total PCB TEQ
Benzo(a)anthracene	Dibenzo(a,h)anthracene	Perchlorate	Total TEQ
Benzo(a)pyrene	Dieldrin	Total PCBs	Trichloroethene
Benzo(b)fluoranthene	Heptachlor	Total Chlordanes	Vinyl chloride
Benzo(k)fluoranthene	Heptachlor epoxide	Total DDD	
Bis(2-ethylhexyl) phthalate (BEHP)	Hexachlorobenzene	Total DDE	

FS Surface Water Screening Approach

All depth-integrated surface water sample results meeting BHHRA/BERA and FS data quality objectives (Category 1 QA2) were used for comparison to SDWA MCLs and human health surface water criteria, including Oregon Effective Water Quality Criteria for Human Health based on fish consumption (Effective June 1, 2010), and NRWQC for consumption of organisms.

For comparison to ecological criteria, all surface water sample results meeting BHHRA/BERA and FS data quality objectives (Category 1 QA2) were used. The maximum individual point water sample result for each chemical was screened against Oregon Table 33A Freshwater Chronic Water Quality Criteria for Protection of Aquatic Life, Oregon Table 20 Freshwater

² Regional Screening Levels for Chemical Contaminants at Superfund Sites, Summary Table November 2010.

Chronic Water Quality Criteria for Protection of Aquatic Life (chemicals with no Table 33A value), and freshwater chronic NRWQC.

Results of the FS surface water screening comparison are summarized in Table 2. Chemicals listed in Table 2 exceeded one or more of the criteria discussed above.

Table 2. Chemicals from FS Screening Evaluation of Surface Water.

2,3,7,8-TCDD	Total DDT
4,4'-DDT	Total DDx
Aluminum	Total PCBs
Arsenic	Mercury
Dieldrin	Zinc
Total PAHs	

FS TZW Screening Approach

TZW sample results also were compared to SDWA MCLs and surface water quality criteria. Consistent with BHHRA/BERA and FS data quality objectives, only Category 1 QA2 sample results were used. TZW samples from all depths were used for comparison to drinking water values (SDWA MCLs). Per EPA comments, only those samples from areas of contaminated groundwater plume discharge to the river were compared to drinking water values.

TZW sample results were also compared to state and federal criteria based on the consumption of organisms. In this comparison, all TZW samples from depths less than 38 cm were used. These TZW sample results were screened against Oregon Effective Water Quality Criteria for Human Health (Effective June 1, 2010; for fish consumption criteria) and NRWQC for consumption of organisms.

For comparison to ecological criteria, all TZW samples from depths less than 38 cm were used. These water sample results were screened against Oregon Table 33A Freshwater Chronic Water Quality Criteria for Protection of Aquatic Life, Oregon Table 20 Freshwater Chronic Water Quality Criteria for Protection of Aquatic Life (chemicals with no Table 33A value), and freshwater chronic NRWQC.

Chemicals in TZW exceeding at least one SDWA MCL or surface water quality criterion are summarized in Table 3.

Table 3. Chemicals from FS Screening Evaluation of TZW.

1,1,2-Trichloroethane	Antimony	Chromium	Total DDx
1,1-Dichloroethene	Arsenic	Chrysene	Manganese
1,2-Dichlorobenzene	Barium	Copper	Mercury
1,2-Dichloroethane	Benzene	Cyanide	Nickel
1,2-Dichloroethene, cis-	Benzo(a)anthracene	Dibenzo(a,h)anthracene	Silver
1,2-Dichloroethene, trans-	Benzo(a)pyrene	Methylene chloride	Tetrachloroethene (PCE)
1,4-Dichlorobenzene	Benzo(b)fluoranthene	Fluoranthene	Thallium
1,2-Dichloropropane	Benzo(k)fluoranthene	Indeno(1,2,3-c,d)pyrene	Trichloroethene (TCE)
4,4'-DDD	Bromodichloromethane	Iron	Vinyl chloride
4,4'-DDE	Cadmium	Lead	Zinc
4,4'-DDT	Chlorobenzene	Total PAHs	
Aluminum	Chloroform	Total DDT	

Chemicals with Potentially Unacceptable Risk from Draft Baseline Risk Assessments

In addition to comparing surface water and TZW sample results to drinking water criteria and surface water criteria for consideration in the FS, the LWG carried forward chemicals with potentially unacceptable risk from the BHHRA and BERA. As both the BHHRA and BERA are currently being revised, the following sources were used to identify chemicals for the initial screening:

- "COCs" from Table 8-1 of Draft BHHRA
- The list of 101 chemicals from "Chemicals and Pathways with [Hazard Quotients] HQ>1" table provided by EPA with their July 16, 2010 comments on the Draft BERA

LIST OF "COCs" TO BE ASSESSED IN THE DRAFT FS

The draft list of all "COCs" to be carried into the FS is provided in Table 4. In the detailed FS analysis, an updated list of chemicals with potentially unacceptable risk will be evaluated based on the revised BHHRA and BERA. Any impacts to the FS contaminant mobility analysis are anticipated to be minor as the "draft" list of chemicals is quite extensive, and as described above, an indicator chemical approach is being used in the FS evaluations.

Table 4. Combined List of "COCs" to be Carried into the FS.

1,1,2-Trichloroethane	Ethylbenzene
1,1-Dichloroethene	Fluoranthene
1,2,4-Trimethylbenzene	Fluorene
1,2-Dichlorobenzene	Gasoline range aliphatics (C4 -C6)
1,2-Dichloroethane	Gasoline range aliphatics (C6 -C8)
1,2-Dichloroethene, cis-	Gasoline range aromatics (C8 -C10)
1,2-Dichloroethene, trans-	Heptachlor
1,2-Dichloropropane	Heptachlor Epoxide
1,3,5-Trimethylbenzene	Hexachlorobenzene
1,4-Dichlorobenzene	Hexavalent chromium
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	High molecular weight PAH (HPAH)
2,4'-DDD	Indeno(1,2,3-c,d)pyrene
2,4'-DDT	Iron
2,4-Dimethylphenol	Isopropyl benzene
2-Methylnaphthalene	Lead
2-Methylphenol	Low molecular weight PAH (LPAH)
4,4'-DDD	m,p-Xylene
4,4'-DDE	Magnesium
4,4'-DDT	Manganese
4-Methylphenol	MCPP
Acenaphthene	Mercury
Acenaphthylene	Methylene chloride
Aldrin	Naphthalene
Aluminum	Nickel
Anthracene	o-Xylene
Antimony	Pentachlorophenol
Aroclor1254	Perchlorate
Arsenic	Phenanthrene
Barium	Phenol
Benzene	Potassium
Benzo(a)anthracene	Pyrene
Benzo(a)pyrene	Selenium
Benzo(b)fluoranthene	Silver
Benzo(g,h,i)perylene	Sodium
Benzo(k)fluoranthene	Tetrachloroethene (PCE)
Benzoicacid	Thallium

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Table 4. Combined List of "COCs" to be Carried into the FS.

Benzylalcohol	Toluene
Beryllium	Total benzofluoranthenes
bis(2-ethylhexyl)phthalate (BEHP)	Total Carcinogenic PAHs
Bromodichloromethane	Total Chlordane
Cadmium	Total DDD
Carbazole	Total DDE
Carbon disulfide	Total DDT
Chlorobenzene	Total DDx
Chloroethane	Total Dioxin TEQ
Chloroform	Total PAHs
Chromium	Total PCBs
Chrysene	Total PCB TEQ
Cobalt	Total TEQ (dioxin+furan+PCB)
Copper	Total xylenes
Cyanide	Tributyltin
Dibenz(a,h)anthracene	Trichloroethene
Dibenzofuran	Vanadium
Dibutylphthalate	Vinyl Chloride
Dieldrin	Zinc
Diesel range aliphatics (C10 -C12)	γ-Hexachlorocyclohexane (Lindane or γ-BHC)
Endrin	δ-Hexachlorocyclohexane (δ-BHC)
Endrin ketone	

SELECTION OF INDICATOR CHEMICALS FOR CONTAMINANT MOBILITY EVALUATIONS

The complete list of "COCs" (Table 4) used in developing the indicator chemicals for the FS contaminant mobility evaluations was based on the chemicals identified from the following efforts described above:

- RI Human Health Surface Water Screening
- FS Screening of Surface Water and TZW
- Chemicals with potentially unacceptable risk from the draft BHHRA and draft BERA.

The mobility, toxicity, and persistence of all the resulting "COCs" were evaluated and the persistent chemicals likely posing some unacceptable risk (e.g., total polychlorinated biphenyls [PCBs], DDx isomers, and benzo(a)pyrene) were selected as indicator chemicals. Although

dioxins and furans also likely pose some unacceptable risk, they are not included as indicator chemicals because of the difficulty in modeling this group of chemicals and due to relatively limited availability of analytical data for dioxins/furans. Additional chemicals that are relatively more mobile and toxic were selected as surrogates for other "COCs" (e.g., metals, polycyclic aromatic hydrocarbons [PAHs], volatile organic compounds [VOCs], and bis(2-ethylhexyl)phthalate [BEHP]). The 13 chemicals selected as indicator chemicals for use in the FS contaminant mobility evaluation are listed in Table 5.

Table 5. Indicator Chemicals Selected for Contaminant Mobility Evaluation in FS

Arsenic	4,4'-DDE
Copper	4,4'-DDT
Mercury	BEHP
Benzo(a)pyrene	Benzene
Naphthalene	Chlorobenzene
Total PCBs	Vinyl chloride
4,4'-DDD	

IDENTIFICATION OF CONTAMINANT MOBILITY EVALUATION CRITERIA

Numeric criteria were identified for the indicator chemicals for use in the capping/confined disposal facility (CDF) long-term effectiveness evaluation and the dredging water quality impact evaluation. Water criteria values for this evaluation were based on:

- Freshwater chronic and acute water quality criteria
- Human health fish consumption criteria
- Drinking water MCLs (only evaluated in areas of contaminated groundwater plumes).

The lowest values from Oregon or federal fish consumption criteria were used.

Water performance criteria for long-term FS contaminant mobility evaluations (i.e., capping chemical isolation modeling and CDF contaminant pathway evaluations) are shown in Table 6. Water performance criteria for short-term FS contaminant mobility evaluations (i.e., dredging water quality impacts) are shown in Table 7. Alternate ecological chronic and acute values were identified where no Oregon or federal criteria are available (see table notes). Freshwater chronic values were used in addition to acute criteria for the dredging short-term water quality impact evaluation to assess the need for best management practices (BMPs).

Table 6. Water Performance Values for Long-term FS Contaminant Mobility Evaluation (µg/L).

All concentrations in µg/L	Eco Chronic WQC ^a	Alternate Eco Chronic Values ^b	Human Health Fish Consumption ^a	Human Health Water Consumption (MCLs)	Background Surface Water Values ^f
4,4'-DDD	--	--	0.00031 ^d	--	0.000079
4,4'-DDE	--	--	0.00022 ^d	--	0.00019
4,4'-DDT	0.001 ^c	--	0.00022 ^d	--	0.00027
Arsenic	150 ^{d,j}	--	0.0175	10	0.54/0.45
Benzene	--	130 ^e	40	5	--
Benzo(a)pyrene	--	0.014 ^e	0.018 ^d	0.2	0.0005
Bis(2-ethylhexyl) phthalate	--	3 ^e	2.2 ^g	6	1.1
Chlorobenzene	--	64 ^h	1600 ^d	100	--
Copper	2.7 ^{j,k}	--	--	1300 ⁱ	3.1/NA
Mercury	0.012 ^j	--	--	2	0.034/NA
Naphthalene	--	12 ^e	--	--	0.024
Total PCBs	0.014	--	0.000064 ^g	0.5	0.00039
Vinyl chloride	--	23400 ^e	2.4 ^g	2	--

Notes:

- a - This column contains the lower of Oregon promulgated water quality criteria and federal NRWQC. The values are from Oregon Table 33A or Table 20 (as modified June 1, 2010) unless noted to be NRWQC.
- b - No chronic WQC available for some chemicals; therefore, alternate values will be used for the contaminant mobility evaluation. Footnotes indicate source of value for each chemical. Alternate Eco Chronic values will not be applied as ARARs.
- c - This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value). Modeled values for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT will be summed and compared to this criterion.
- d - NRWQC value used because no Oregon value available. Note that in most cases, Oregon's proposed Tables 33A and 33B incorporated these NRWQC, but those tables are not currently effective.
- e - Value shown is water screening level from Draft BERA. See Table 5-2 of Draft BERA Attachment 5. No chronic WQC available.
- f - Background surface water values are upper prediction limits (UPLs; total concentrations, outliers removed) from the Draft RI. Values for additional chemicals were developed using the same methods as those in the Draft RI and will be presented in the revised draft RI. Where two values are present, first value is for the total fraction and second value is for the dissolved fraction.
- g - NRWQC value used because it is lower than Oregon value. Note that in each case Oregon's proposed Table 33A incorporated the NRWQC, but those are currently not the "effective" values in Oregon.
- h - Value is Tier II secondary chronic value from Suter and Tsao 1996. No chronic WQC available and no screening level value for this chemical was provided in the BERA.
- i - The value shown is an action level. Copper is regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps.

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- j – This criterion has been applied on a dissolved basis consistent with Table 33A and/or the NRWQC.
- k – This criterion is hardness-dependant and is calculated based on a hardness of 25 parts per million (ppm). Hardness function is provided in Table 33A.

-- = Value not available

MCL = Maximum Contaminant Level

ARAR = applicable and relevant or appropriate requirement

NRWQC = National Recommended Water Quality Criteria

BERA = Baseline Ecological Risk Assessment

WQC = Water Quality Criteria

NA = Dissolved surface water background value not available but will be provided in draft FS

Table 7. Water Performance Values for Short-Term FS Contaminant Mobility Evaluation (µg/L).

All Concentrations in µg/L	Eco Acute WQC ^a	Alternate Eco Acute Values ^b	Eco Chronic WQC ^a	Alternate Eco Chronic Values ^b	Background Surface Water Values ^f
4,4'-DDD	--	0.06 ^h	--	--	0.000079
4,4'-DDE	--	1050 ^h	--	--	0.00019
4,4'-DDT	1.1 ^c	--	0.001 ^c	--	0.00027
Arsenic	340 ^{d,k}	--	150 ^{d,k}	--	0.54/0.45
Benzene	--	5300 ^h	--	130 ^e	--
Benzo(a)pyrene	--	4.0 ⁱ	--	0.014 ^e	0.0005
Bis(2-ethylhexyl) phthalate	--	940 ^h	--	3 ^e	1.1
Chlorobenzene	--	250 ^h	--	64 ^g	--
Copper	3.6 ^{k,l}	--	2.7 ^{k,l}	--	3.1/NA
Mercury	1.4 ^{k,j}	--	0.012 ^k	--	0.034/NA
Naphthalene	--	2300 ^h	--	12 ^e	0.024
Total PCBs	2	--	0.014	--	0.00039
Vinyl chloride	--	23400 ^e	--	23400 ^e	--

Note:

a - This column contains the lower of Oregon promulgated water quality criteria and federal NRWQC. The values from Oregon Table 33A or Table 20 (as modified June 1, 2010) unless noted to be NRWQC.

b - No acute or chronic WQC available for some chemicals; therefore, alternate values will be used for the contaminant mobility evaluation. Footnotes indicate source of value for each chemical. Alternate Eco Acute and Chronic values will not be applied as ARARs.

c - This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value). Modeled values for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT will be summed and compared to this criterion.

d - NRWQC value used because Oregon value available for trivalent arsenic only.

e - Value shown is water screening level from Draft BERA. See Table 5-2 of Draft BERA Attachment 5. No acute or chronic WQC available.

f - Background surface water values are upper prediction limits (UPLs; total concentrations, outliers removed) from the Draft RI. Values for additional chemicals were developed using the same methods as those in the Draft RI and will be presented in the revised draft RI. Where two values are present, first value is for the total fraction and second value is for the dissolved fraction.

g - Value is Tier II secondary chronic value from Suter and Tsao 1996. No chronic WQC available and no screening level value for this chemical was provided in the BERA.

h - Oregon Table 33C freshwater acute guidance value exists and was used for this chemical.

i - Value from EPA 2003 (Procedures for the derivation of equilibrium partitioning sediment benchmarks [ESBs] for the protection of benthic organisms: PAH mixtures [EPA-600-R-02-013]). No Oregon Table 33C freshwater acute guidance value exists for this chemical.

j - NRWQC is lower than Oregon's Table 33A value of 2.4 µg/L, which was reaffirmed as the Oregon criterion in 2004, after EPA published its NRWQC of 1.4 µg/L. Resolution of which should be applied, if it is at all determinative, can be made in the ARARs analysis.

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k – This criterion has been applied on a dissolved basis consistent with Table 33A and/or the NRWQC.
l – This criterion is hardness-dependant and is calculated based on a hardness of 25 ppm. Hardness function is provided in Table 33A.

-- = Value not available

ARAR = applicable and relevant or appropriate requirement

NRWQC = National Recommended Water Quality Criteria

BERA = Baseline Ecological Risk Assessment

WQC = Water Quality Criteria

NA = Dissolved surface water background value not available but will be provided in draft FS